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(54) Hose coupling

(57) In a hose coupling comprising a connecting portion (1) on which an end portion (4) of the hose (3) is pushed, and an elastic clamping ring (2), the connecting portion is provided with a holding rib (5), the side (7) of the holding rib towards the push-on end of the connecting portion being conical. The hose is pushed beyond the holding rib, while the clamping ring surrounds the hose in the region of the holding rib and is provided with axial slots 12 which are closed at their ends and which pass radially through the clamping ring. In order to simultaneously push the hose and clamping ring beyond the holding rib while providing a good seal, side (8) of holding rib (5) is conical and provided with shallow teeth (9). Slots (12) extend over more than the axial length of the toothed side (8) of holding rib (5) and web portions (13) between the slots are elastically flexible.

Fig. 1

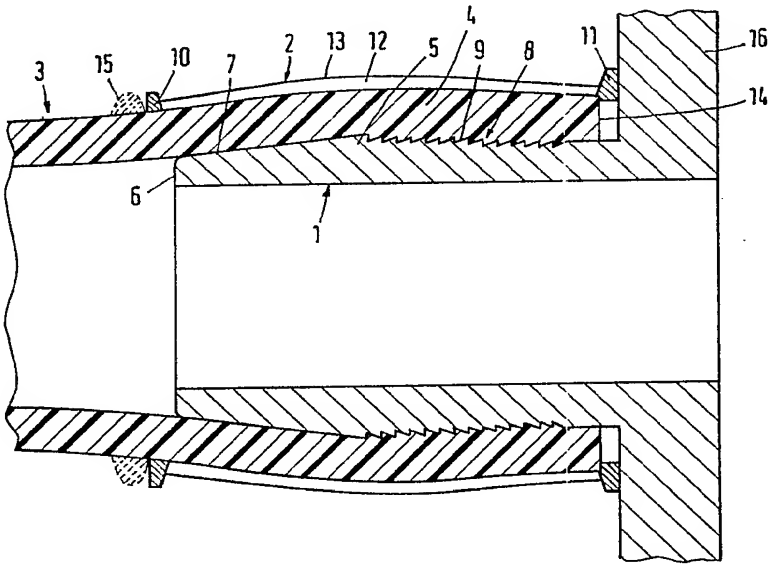

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Fig. 1

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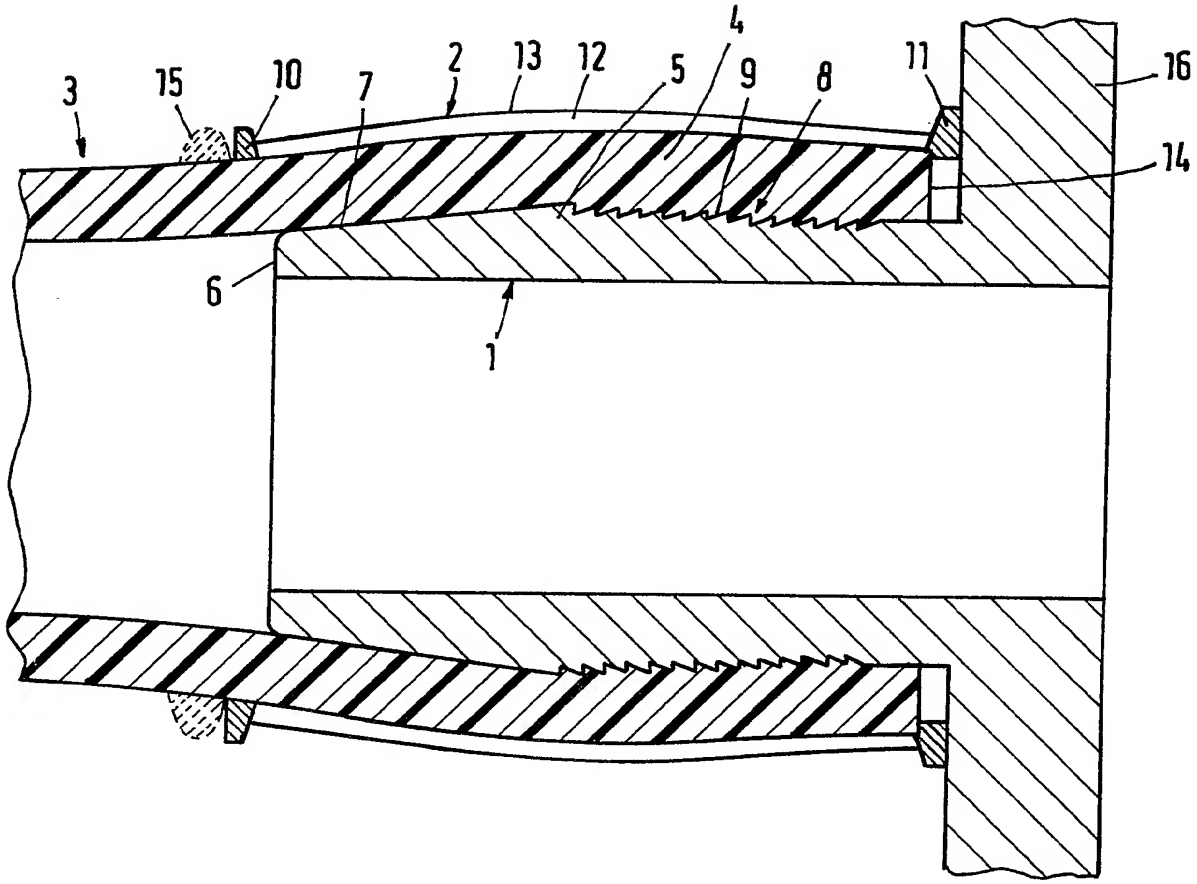
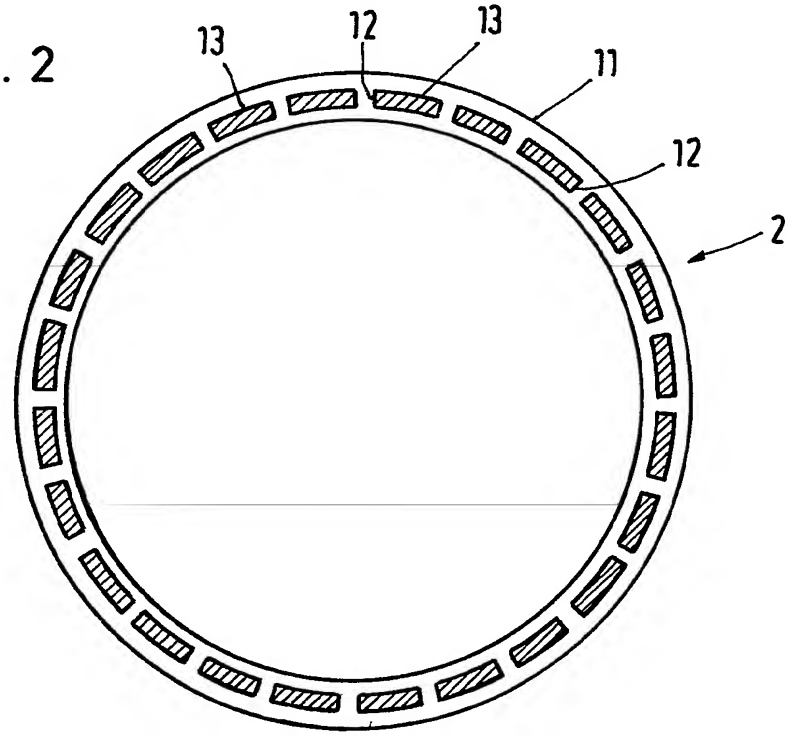


Fig. 2



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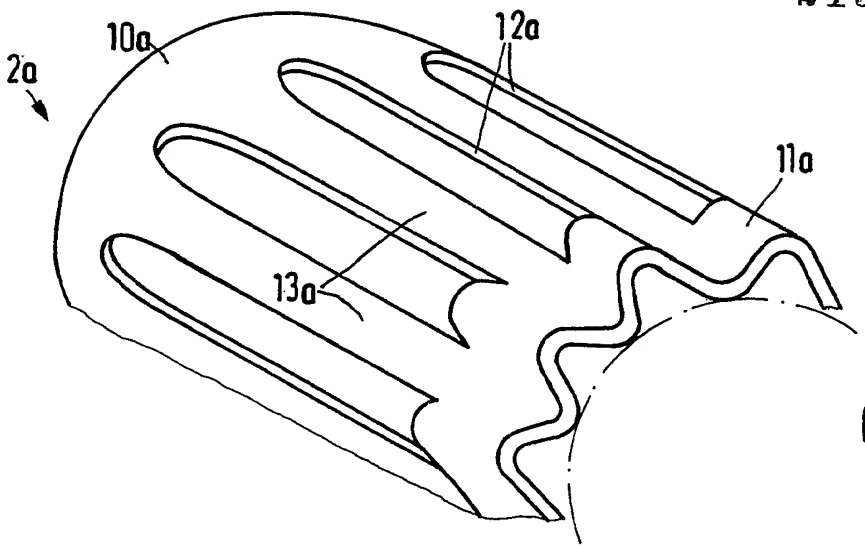

Fig.3

Fig.4

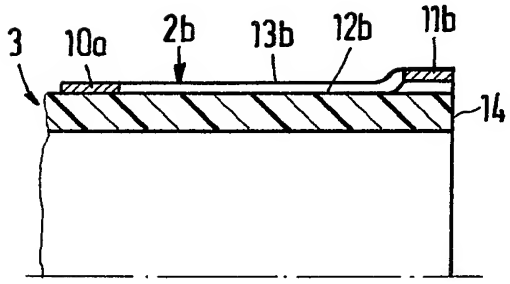

Fig.5

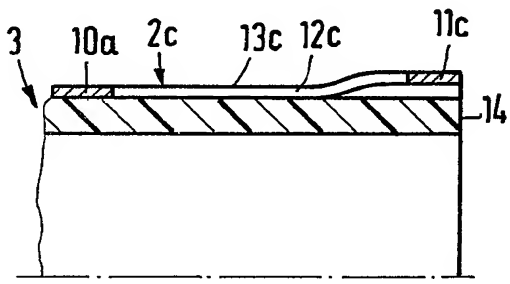

Fig.6

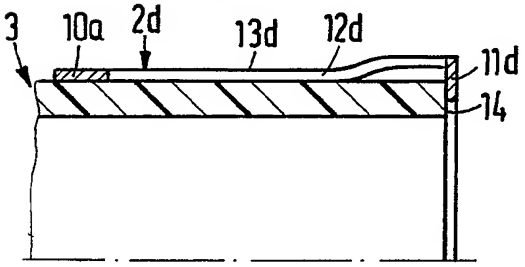

Fig.7

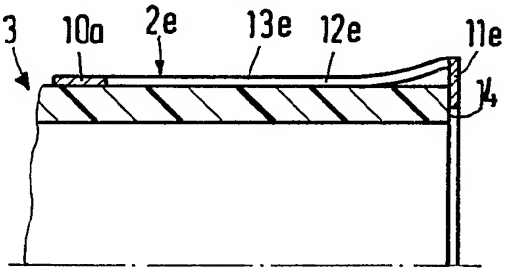

Fig.8

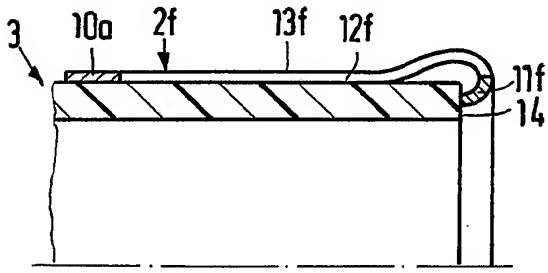

Fig.9

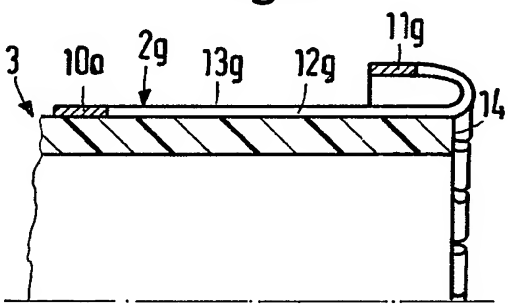

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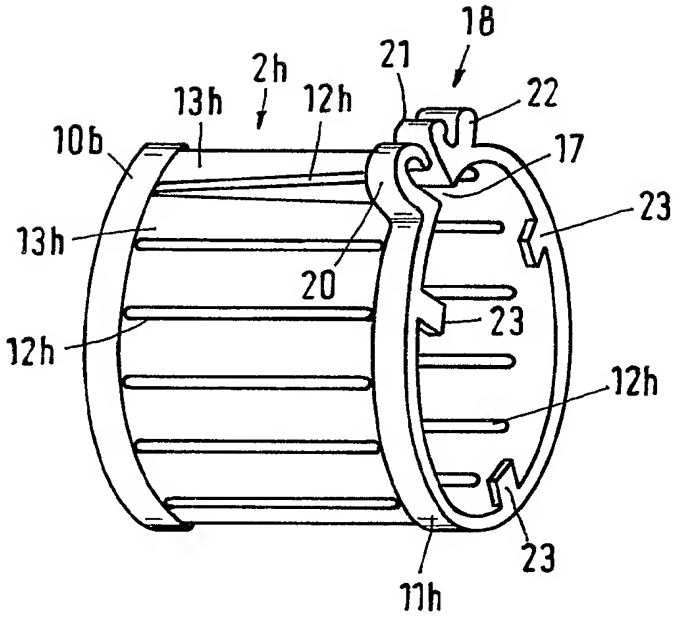
Fig. 10



SPECIFICATION

Hose coupling

This invention relates to a coupling for a hose.

A proposed hose coupling includes a connecting member on which an end portion of a hose can be pushed, and an elastic clamping ring, with the connecting member being provided on its outside with a holding rib which extends therearound. The front side of the holding rib, is directed towards the push-on-end of the connecting member and is substantially conical for the end portion of the hose to be pushed thereover. The clamping ring surrounds the pushed-on end portion of the hose, when the latter is on the connecting member, in the region of the holding rib, has closed peripheral edge portions at the axial ends, and is provided with slots which pass radially therethrough, which extend in the axial direction of the clamping ring and which are uniformly distributed in the peripheral direction.

In a known hose coupling of this kind, the rear side face of the holding ring which is remote from the push-on end of the connecting member extends in a radial plane. At the axially forward and rearward ends, the clamping ring has a respective inwardly projecting annular bead. The front bead is shaped to press the end portion of the hose, which is fitted on to the connecting member, against the conical side of the holding rib and the rear annular bead is shaped to press the end portion against the cylindrical surface of the connecting member, which adjoins the radial side surface of the holding rib. The slots in the clamping ring are axially shorter than the axial length of the holding rib and web portions between the slots are comparatively thick in the radial direction, the thickness thereof increasing on the inside towards the ends so that, in conjunction with their axially short dimensions, they are virtually inflexible in the radial direction and their gripping force in the region of the holding rib is comparatively small. This has an adverse effect on the sealing action and the degree with which the hose is secured against being pulled axially off the connecting member.

A hollow space in which there is no sealing effect may be formed in the region between the rear annular bead and the radial face of the holding rib, between the cylindrical outside surface of the connecting portion and the hose. Before the hose is pushed on to the connecting member, the clamping ring is fitted over the hose and then the hose and the clamping ring are together pushed over the connecting member for carrying the hose. In order to permit the hose and the clamping ring to be easily pushed on, the inside diameter at least of the radially inwardly projecting annular bead on the clamping ring, being the annular bead which leads in the direction in which the hose is pushed on to the connecting member, must be substantially larger than the outside diameter of the holding rib so that the clamping force in the assembled condition, between the front annular bead and the cylindrical outside surface of the connecting portion, is possibly too small, for securing the hose in position in the axial direction and providing a seal, in an adequate fashion in spite of the above-mentioned hollow space. If on the other hand the inside diameter of the front annular bead is smaller, then an excessively high force is required to push the hose on to the connecting member, and it is possible that that force cannot at least be applied manually.

There is thus a need for a generally improved hose coupling which provides an adequate sealing action and axial securing effect, with the hose and the clamping ring being easier to push on to the connecting member.

According to the present invention there is provided a hose coupling including a connecting member on which an end portion of a hose can be pushed, which connecting member is provided on its outside with a holding rib which extends therearound, the front side of the holding rib, which is directed towards the push-on end of the connecting member being substantially conical for the end portion of the hose to be pushed thereover, and an elastic clamping ring for surrounding the pushed-on end portion of the hose, when the latter is on the connecting member, in the region of the holding rib, which ring has closed peripheral edge portions at the axial ends, and is provided with slots which pass radially therethrough, which extend in the axial direction of the clamping ring and which are uniformly distributed in the peripheral direction, wherein the clamping ring slots extend over more than the axial length of the rear side of the holding rib, which is remote from the push-on end of the connecting member, web portions between the slots are elastically flexible in the radial direction, the rear side of the holding rib is substantially conical, and the mean diameter of the web portions is constant at least over the major part of their length before a nose end and the clamping ring are pushed on to the connecting member.

The fact that the side of the holding ring which is remote from the push-on end of the connecting member is of a conical configuration eliminates a hollow space or cavity between the hose and the connecting member and, by virtue of the long web portions which bend radially outwardly at the region of the holding rib, the hose is pressed firmly against the holding rib and the connecting member over a greater axial length, with the web portions producing a spring biassing effect, so as to provide a better sealing effect and an axial securing action. If therefore the front end of the clamping ring carries an annular bead which projects radially inwardly, the inside diameter thereof can be made comparatively large. Possibly, a radially inwardly projecting annular bead at the front end of the clamping ring can be entirely omitted. This facilitates pushing the hose and the clamping ring jointly on the connecting member. In this case, the long elastic web portions facilitate the operation of pushing the hose on to the connecting member, while also providing for a spring biassing or prestressing effect in a comparatively long axial region of the end portion of the hose, which is pushed on to the connecting member, so that in that region the clamping ring can resiliently yield to thermal expansion of the hose material

and can retighten in the event of shrinkage of the hose material, caused by cooling. This gives a further increase in the level of security of the sealing action produced.

It is also desirable for the rear side of the holding rib to be provided with shallow teeth extending therearound. That even further improves the axial securing action.

The teeth may be of a sawtooth configuration in axial section and their side face which is remote from the push-on end of the connecting portion may lie in a radial plane. That tooth configuration on the one hand facilitates the operation of pushing the hose into the connecting member while on the other hand it resists, to a particularly high degree, the hose being pulled or slipping off the connecting member.

Preferably, the slots extend at least over the entire length of the holding rib. With this configuration, the web portions press the hose material resiliently against the holding rib over the entire axial length thereof, which gives a correspondingly higher level of security and certainty of sealing action and an improved axial securing effect.

It is also desirable for the angle of inclination of the rear side face of the holding rib to be less than that of the front side face of the holding rib, for the axial length of the two side faces to be substantially the same and for the outside diameter of the connecting member at the push-on end, with the holding rib adjoining same, to be somewhat smaller than the inside diameter of the hose in a non-stressed condition. This makes it easier for the connecting member to be introduced into the hose and makes it easier for the hose to be pushed on to the connecting member. Nonetheless, the predominant part of the hose which is pushed on to the connecting member, in particular the front end thereof, bears under an inherent biassing or prestressing force against the connecting portion, thereby increasing the sealing effect.

The axial length of the clamping ring may be such that the end of the clamping ring which is remote from the pushed-on end of the hose lies in front of the push-on end of the connecting member. In that way, the clamping ring resists the hose material lifting away from the conical front side of the holding rib, even when the hose is radially bent or deflected in front of the push-on end of the connecting member.

The one peripheral edge portion of the clamping ring may bear against the end face of the pushed-on end of the hose. In that way, the peripheral edge portion forms an abutment to prevent the clamping ring from being pushed on to the hose too far.

The clamping ring may be of a constant inside diameter, before the hose and the clamping ring are pushed on to the connecting member, over the length of the slots. This simplifies manufacture of the clamping ring and ensures that, in their axially central region with which they bridge over the crest of the holding rib, the web portions are caused elastically to bulge out and apply the desired spring biassing effect to the hose.

In addition, the peripheral edge portion of the clamping ring, which is beside the rear side of the holding rib, may be corrugtgated in the peripheral direction. This permits the front end of the clamping ring, considered in the direction in which the ring is fitted on to the connecting member, to enlarge, thereby facilitating pushing the clamping ring into position on the connecting member.

The latter effect may also be achieved by the mean diameter of the clamping ring being constant before the hose and the clamping ring are pushed on to the connecting member, over a main portion of the axial length of the clamping ring, and, in an intermediate region, which adjoins the main portion and which is adjacent to the peripheral edge portion which is beside the rear side of the holding rib, increasing in a direction towards said peripheral edge portion.

In this connection, the intermediate region may be bent back radially outwardly and over the outside of the clamping ring so that the peripheral edge portion which is beside the rear side face of the holding rib surrounds the main portion at a radial spacing. In this way, the clamping ring bears constantly against the hose over its entire length. Nonetheless, it can expand at its front end and can easily be pushed over the holding rib, with the hose.

The peripheral edge portion of the clamping ring, which is beside the rear side face of the holding rib, may be interrupted in the region between two adjacent web portions, and the interruption may be closed by a closure means. In this case, the closure means of the clamping ring may be opened before the hose and the clamping ring are pushed on to the connecting member, in order to facilitate this operation.

The closure means may be a retaining or detent closure. Such a closure means is easy to handle.

In particular, the closure means may be provided with portions which are formed on both sides of the interruption and which engage one behind the other, thereby providing a closure means of simple construction.

A respective projection may be formed on the peripheral edge portion having the interruption, on both sides of the interruption, in the vicinity thereof. The projections facilitate the operation of closing the closure means, as, for the purposes of closing the closure means, they only have to be brought together in the peripheral direction.

In this arrangement, one projection may form the one closure portion so that there is no need for an additional projection acting as a support means for handling the closure means when closing same.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:-

Figure 1 is a view in axial section through a hose coupling according to the invention.

Figure 2 is a view in radial section through a clamping ring of the hose coupling shown in Figure 1,

Figure 3 is a perspective view of part of a clamping ring of a hose coupling according to a second embodiment of the invention.

Figures 4 to *9* are views in axial section of clamping rings of hose couplings according to

further embodiments of the invention, on a hose, and

Figure 10 is a perspective view of a clamping ring of a hose coupling according to another embodiment of the invention.

In the embodiment of the invention illustrated in Figures 1 and 2, the hose coupling comprises a connecting member or portion 1 and a clamping ring 2 of elastic plastics material, a hose 3 being clamped therebetween, by its end portion 4.

The connecting portion 1 has a holding rib 5 extending therearound, which begins at the push-on end of the connecting portion 1 and terminates approximately at the rearward end of the connecting portion 1. The angle of inclination of the conical side 7 of the holding rib 5, which adjoins the push-on end 6, is somewhat larger than the angle of inclination of the rear side 8 which is remote from the push-on end 6 and which is provided with shallow teeth 9 extending therearound. The outside diameter of the tubular connecting portion 1 at the push-on end, being about 28 mm, is somewhat smaller than the inside diameter of the hose 3 in a non-stressed condition, being about 29 mm, in order to make it easier for the hose 3 to be pushed on. The outside diameter of the rearward end of the connecting portion 1, at about 31 mm, is somewhat larger than the inside diameter of the hose 3 in the unstressed condition. The side surfaces 7 and 8 are of approximately the same length of 20 mm in the axial direction, and are at an angle of about 7° and about 3° respectively. The largest outside diameter of the holding rib 5 is about 33 mm. The teeth 9 are substantially sawtooth-shape in cross-section. Their conical side face which is towards the push-on end 6 extends over an axial length of about 1.5 mm while the radial side face thereof extends over about 0.4 mm. The angle of inclination of the conical sides of the teeth is therefore about 15°.

The clamping ring 2 has twelve slots 12 which pass radially therethrough and which extend in the axial direction as far as peripheral edge portions in the form of annular beads 10 and 11. The slots 12 are defined by thin axial web portions 13 and are arranged at uniform spacings from each other in a distributed array around the periphery of the clamping ring 2. The width of the slots is about 1 mm. The annular beads 10 and 11 are closed in the peripheral direction. The annular bead 11 bears with a radially inwardly projecting flange portion against the end face 14 of the end portion 4 so that the clamping ring 2 cannot be pushed further over the end portion 4. Instead of the flange portion, the hose 3 may be provided, on its outside, with an annular bead 15 to act as an abutment for the clamping ring 2. Omitting the radially inwardly projecting flange portion on the annular bead 11 and forming the two annular beads 10 and 11 with the same inside diameter as that of the web portions 13 further facilitates manufacturing the clamping ring 2 and pushing the clamping ring 2 on to the hose 3, and likewise jointly pushing the hose 3 and the clamping ring 2 on to the connecting portion 1, beyond the holding rib 5.

The slots 12 extend at least over the axial length of the toothed side face 8, but preferably over more than the entire axial length of the holding rib 5, as illustrated. The annular bead 10 is therefore disposed in front of the push-on end 6.

The inside diameter of the clamping ring 2 in the region of the slots 12, being about 28mm, is approximately equal to the outside diameter of the hose 3 in the non-stresssed condition, which in turn is larger than the largest outside diameter of the holding rib 5.

The hose coupling shown in Figures 1 and 2 has the advantage that the end portion 4 of the hose 3 is pressed against the connecting portion 1 over the entire axial length of the end portion 4, and the hose material of the end portion 4 is under a spring bias, as a result of the resiliency of the web portions 13. The spring biassing effect ensures that in the clamping region the clamping ring 2 yields to thermal expansion of the hose material and prevents the hose material from being subjected to an excessive pressing force. That counteracts permanent deformation of the hose material. On the other hand, after thermal expansion of the hose material and subsequent cooling thereof, with the hose material shrinking, the arrangement also ensures that the hose bears firmly against the connecting portion 1 because the elastic web portions spring back into their starting position. Because the clamping ring 2 is longer than the end portion 4 of the hose 3 so that the clamping ring 2 projects beond the push-on end 6 (towards the left in Figure 1), that arrangement resists the end portion 4 lifting radially away from the connecting portion 1, particularly the front side face 7, if the hose 3 is radially deflected (bent) in front of the connecting portion 1. In that case the clamping ring 2, in conjunction with the conical and toothed configuration of the rear side face 8 of the holding rib 5, affords a high degree of security in regard to the end portion 4 being pulled or slipping axially off the connecting portion 1, as could be the case when there is a high fluid pressure in the interior of the hose 3 or in the event of a high axial force applied thereto from the outside.

Before the hose 3 is pushed on to the pipe portion 1, the clamping ring 2 is pushed over the hose 3 into the illustrated position. The hose 3 and the clamping ring 2 are then jointly pushed on to the connecting portion 1, in which respect a flange 16 at the rearward end of the connecting portion 1 or a wall, corresponding to the flange 16, of a housing to which the pipe portion 1 is for example integrally connected serves as an abutment and prevents the hose from being pushed on too far. In other words, the arrangement ensures that the clamping ring 2 is in a position with its rearward end (annular bead 10) outside the connecting portion 1.

Figure 3 is a perspective view on an enlarged scale of a part of a second embodiment of a clamping ring 2a. The clamping ring 2a may be used in place of the clamping ring 2 for the hose coupling shown in Figure 1, and also comprises elastic plastics material. Instead of the annular beads 10 and 11, it has closed peripheral edge portions 10a and 11a. The peripheral edge portion 11a which is beside the side face 8 of the holding rib 5 is corrugated in the peripheral direction while the other peripheral edge

portion 10a is smooth. The clamping ring 2a also has axial slots 12a which are defined by web portions 13a. The axial length of the clamping ring 2a and the slots 12a and the inside diameter may correspond to those of the clamping ring 2.

In this embodiment, the corrugated peripheral edge portion 11a makes it easier for the clamping ring 2a to be pushed on over the holding rib 5. In other respects, this arrangement has the same advantages as the first embodiment described.

Figures 4 to 9 show further embodiments of the clamping ring on the hose 3. In all clamping rings 2b to 2g, the mean diameter (the mean value of the inside and outside diameters) is constant over a main portion of the axial length of the clamping ring before the hose 3 and the clamping ring 2b to 2g are pushed on to the connecting portion 1 shown in Figure 1, which is not illustrated in Figures 4 to 9. In an intermediate region which adjoins the above-mentioned main portion and which is adjacent to the peripheral edge portion 11b to 11g which is disposed beside the rear side face 8 of the holding rib 5 shown in Figure 1, the mean diameter increases in a direction towards the peripheral edge portion 11b to 11g in order to facilitate pushing the hose 3 and the clamping ring 2b to 2g on to the connecting portion 1, beyond the holding rib 5.

In the embodiments illustrated in Figures 4 and 5, the peripheral edge portions 11b to 11c extend at a spacing parallel to the peripheral surface of the hose 3 (in the non-stressed condition), while the edges of the peripheral edge portions 11b and 11c, which are leading when the ring is pushed on to the connecting portion 1, are disposed in the plane of the end face 14 of the hose 3.

In the embodiments shown in Figures 6 to 8, the peripheral edge portions 11d to 11f which are the leading portions when the ring is pushed on to the connecting portion 1 on the other hand bear against the end face 14 so that they act as an abutment to prevent the clamping ring from being pushed on to the hose 3 too far.

In the embodiment illustrated in Figure 9, the bent or curved intermediate region is bent back radially outwardly and over the outside of the clamping ring 2g. Therefore, the peripheral edge portion 11g which, after the component has been pushed on to the connecting portion 1, is disposed beside the rear side face 8 of the holding rib, also extends around and at a radial spacing from the main portion of the clamping ring 2g, the main portion being of constant diameter (before the fitting operation). However, the web portions 13g bear against the hose 3 over a longer axial section.

As shown in Figure 10, the peripheral edge portion 11h of the clamping ring 2h, which is the leading edge in the fitting operation, has an interruption 17 in the region of one of the slots 12h or between two adjacent web portions 13h. Moreover, the slots 12 are closed at their ends as the rear peripheral edge portion 10b and, in the remaining region, also the peripheral edge portion 11h, are of a continuous configuration in the peripheral direction. The interruption 17 is opened when the hose 3 and the clamping ring 2h are pushed on to the connecting portion 1 in order to facilitate that operation, and is closed after the fitting operation by a closure means 18.

The closure means 18 is a detent or snap closure means having two closure portions 20 and 21 in the form of substantially radial projections which are formed on the peripheral edge portion 11h on both sides of the interruption 17. One closure portion 20 is undercut on its side which is towards the interruption 17 so that it is approximately in the shape of a question mark. The other closure portion 21 is radially somewhat shorter than the closure portion 20 and is undercut on its side which is remote from the interruption 17. Another radial projection 22 which is also formed close to the interruption 17 on the undercut side of the closure portion 22 facilitates the operation of closing the closure means. In that arrangement, the projections 20 and 22 are pressed together in the peripheral direction manually or by means of a tool until the substantially radially inwardly projecting part of the closure portion 20 has slipped over the closure portion 21 and engages under the undercut configuration of the closure portion 21. The closure means be opened again as desired by bending back the radial section of the closure portion 20 in a radial and outward direction.

When the clamping ring 2h is pushed on, radially inwardly projecting projections 23 of the peripheral edge portion 11h bear against the end face 14 of the hose 3 in order to prevent the clamping ring 2h from being pushed on to the hose 2 too far.

Modifications in the illustrated embodiments may provide for example that, in the embodiment illustrated in Figures 1 and 2, the clamping ring 2, instead of the annular bead 11, has a substantially hook-shaped peripheral edge portion which first extends somewhat radially inwardly and then somewhat axially forwardly towards the axially opposite end of the clamping ring 2 so that the cross-section thereof (in an axial plane of the clamping ring 2) is substantially in the form of a U lying on its side. In all embodiments moreover, the web portions, instead of being of square or rectangular cross-section, may be of a substantially U-shaped or elliptical cross-section. Then, teeth which correspond to the teeth 9 may also be formed on the front side 7 of the holding rib or only on the front side 7.

CLAIMS

1. A hose coupling including a connecting member on which an end portion of a hose can be pushed, which connecting member is provided on its outside with a holding rib which extends therearound, the front side of the holding rib, which is directed towards the push-on end of the connecting member being substantially conical for the end portion of the hose to be pushed thereover, and an elastic clamping ring for surrounding the pushed-on end portion of the hose, when the latter is on the connecting member, in the region of the holding rib, which ring had closed peripheral edge portions at the axial ends, and is provided with slots which pass radially therethrough, which extend in the axial direction of the clamping ring and which are uni-

formly distributed in the peripheral direction, wherein the clamping ring slots extend over more than the axial length of the rear side of the holding rib, which is remote from the push-on end of the connecting member, web portions between the slots are elastically flexible in the radial direction, the rear side of the holding rib is substantially conical, and the means diameter of the web portions is constant at least over the major part of their length before a hose end and the clamping ring are pushed on to the connecting member.

2. A hose coupling according to claim 1, wherein the rear side of the holding rib is provided with shallow teeth extending therearound.

3. A hose coupling according to claim 2, wherein the teeth are of a sawtooth configuration in axial section and their side which is remote from the push-on end of the connecting member lies in a radial plane.

4. A hose coupling according to any one of claims 1 to 3, wherein the slots extend at least over the entire axial length of the holding rib.

5. A hose coupling according to any one of claims 1 to 4, wherein the angle of inclination of the rear side of the holding rib is less than that of a front side of the holding rib, the axial length of both sides is substantially the same and the outside diamter of the connecting member, at the push-on end, with the holding rib adjoining same, is somewhat smaller than the insisde diameter of a hose in a non-stressed condition to be pushed on the connecting member.

6. A hose coupling according to any one of claims 1 to 5, wherein the end of the clamping ring which is remote from the pushed-on end of the hose is disposed in front of the push-on end of the connecting member.

7. A hose coupling according to any one of claims 1 to 4, wherein one peripheral edge portion of the clamping ring bears against the end face of a hose end when pushed on the connecting member.

8. A hose coupling according to any one of claims 1 to 7, wherein the clamping ring is of constant inside diameter before a hose and the clamping ring are pushed on to the connecting member, over the length of the slots.

9. A hose coupling according to any one of claims 1 to 8, wherein a peripheral edge portion of the clamping ring, which is disposed beside the rear side of the holding rib is corrugated in the peripheral direction.

10. A hose coupling according to any one of claims 1 to 7, wherein the mean diameter of the clamping ring is constant before a hose and the clamping ring are pushed on to the connecting member, over a main portion of the axial length of the clamping ring, and, in an intermediate region which adjoins the main portion and which is adjacent to the peripheral edge portion which is beside the rear side of the holding rib, increases in a direction towards said peripheral edge portion.

11. A hose coupling according to claim 10, wherein the intermediate region is bent back radially outwardly and over the outside of the clamping ring so that the peripheral edge portion which is disposed beside the rear side of the holding rib surrounds the main portion at a radial spacing therefrom.

12. A hose coupling according to any one of claims 1 to 7, wherein the peripheral edge portion of the clamping ring, which is disposed beside the rear side of the holding rib, is interrupted in the region between two adjacent web portions and the interruption is closed by a closure means.

13. A hose coupling according to claim 12, wherein the closure means is a retaining or detent closure means.

14. A hose coupling according to claim 13, wherein the closure means has portions which are formed on both sides of the interruption and which engage one behind the other.

15. A hose coupling according to claim 14, wherein formed on both sides of the interruption in the vicinity thereof is a respective projection, on the peripheral edge portion which has the interruption.

16. A hose coupling according to claim 15, wherein the one projection forms the one closure portion.

17. A hose coupling substantially as hereinbefore described with reference to Figures 1 and 2, Figures 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9 or Figure 10 of the accompanying drawings.

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